

REMARKS/ARGUMENTS

The present amendment is submitted in response to the Office Action dated May 4, 2005, which set a three-month period for response. Filed herewith is a Request for a Three-month Extension of Time, making this amendment due by November 4, 2005.

Claims 7 – 9, 11, 12, and 16 - 19 are pending in this application.

In the Office Action, claims 7, 9, 11, 12, and 19 were rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 4,790,743 to Leikert et al. Claims 8 and 18 were rejected under 35 U.S.C. 103(a) as being unpatentable over Leikert et al as applied to claims 7 and 9 and further in view of U.S. Patent No. 5,411,394 to Beer et al. Alternatively, claims 7 and 17 were rejected under 35 U.S.C. 103(a) as being unpatentable over Leikert et al in view of U.S. Patent No. 4,739,713 to Vier et al. Claim 16 was rejected under 35 U.S.C. 103(a) as being unpatentable over Leikert et al in view of U.S. Patent No. 4,739,713 to Vier et al as applied to claim 7 and further in view of U.S. Patent No. 5,809,910 to Svendssen et al.

As defined in claim 7, the present invention relates to a method of burning a nitrogen-containing fuel while reducing the emission of nitrogen oxides. The method comprises the steps of producing a sub-stoichiometric primary zone in the form of a flame core from all of the fuel and primary air, and supplying the flame core with a nitrogen oxide reducing agent so that the reducing agent is distributed within the flame core, wherein the reducing agent is a nitrogen compound or a hydrocarbon.

In contrast, the primary reference to Leikert et al discloses a method for burning a nitrogen-containing fuel, while reducing the emission of nitrogen oxides. The Leikert method includes the steps of producing a sub-stoichiometric primary

zone 7 in the form of a flame core and also injecting, at a secondary fuel zone 8 outside of the primary flame zone 7, a reduction fuel. This reduction fuel is injected via reduction fuel nozzles 4.

The Applicants respectfully submit that Leikert teaches away from the method of the present invention, which specifically defines supplying the sub-stoichiometric primary zone with a nitrogen oxide reducing agent. Rather, Leikert specifically teaches a primary flame zone 7 to which a primary fuel (coal dust) and combustion air are fed. In addition, Leikert discloses that a reducing agent is introduced into its secondary flame zone 8, not its primary flame zone 7.

In the present Office Action, the Examiner has maintained his position that the sub-stoichiometric primary zone 7 and the secondary fuel zone 8 of Leikert can be interpreted to be a "flame core" in the sense of the present invention. This assertion in the Office Action is premised on the disclosure of Leikert that the secondary zone 8 is "in the vicinity and around the primary flame zone" (column 3, lines 34 - 35 of Leikert) and that the reducing agent supplied by the nozzles 4 of the Leikert burner is "clearly distributed within the flame core formed from the flame zones 7 and 8."

The Applicants strongly disagree. Leikert unambiguously discloses that its reducing agent is not introduced into its primary flame zone 7 but, instead, is introduced around this primary flame zone. The Leikert arrangement is an example of the conventional "fuel staging" approach to NO_x reduction; that is, the Leikert arrangement introduces the reducing agent into a reduction zone that is located downstream of its burner zone, and a remainder portion of the fuel is added at the reduction zone - i.e., the fuel itself serves both as a fuel and a reducing agent.

In fact, if the Leikert arrangement were operated as asserted in the Office

Action, to distribute its reducing agent into its primary flame zone 7 instead of introducing its reducing agent into the secondary zone 8 around the primary flame zone 7, the air to fuel ratio within the secondary zone 8 would be practically the same as the air to fuel ratio within the primary flame zone 7 and there would be no demarcation between the secondary zone 8 and the primary flame zone 7.

This is clearly contrary to the unambiguous disclosure of the Leikert patent itself that its secondary zone 8 is separate and different from its primary flame zone 7.

In addition to this significant and patentable difference relating to the flame core, the NO_x reduction mechanism of Leikert is quite different than that of the present invention. According to Leikert, NO_x is produced in the primary flame zone 7 and reduced in the secondary zone 8. The NO_x reducing agent - i.e., the staged fuel - is introduced through the nozzles 4 to be burned in the secondary zone 8.

In contrast, in the present invention, the reducing agent is not burned at the location in which it is introduced (the sub-stoichiometric primary zone in the form of a flame core) by reason of a lack of oxygen in this sub-stoichiometric primary zone. Rather, the reducing agent introduced in the present invention reacts directly with the nitrogen oxides within this sub-stoichiometric primary zone.

This different approach of the method of the present invention can be seen in that the introduced reducing agent is in the amount of about 1% of the nitrogen-containing fuel. On the other hand, in the Leikert arrangement, a considerably higher ratio of reducing agent to fuel must prevail, as it would otherwise not be possible to effect a reduction from n = 0.9 in the primary flame zone 7 to n = 0.55 in the secondary zone 8.

In addition, although Leikert discloses that coal dust can be injected into its primary flame zone 7, Leikert does not teach or disclose that coal dust introduced into its primary flame zone 7 is a reducing agent. Instead, any coal dust introduced into the primary flame zone 7 of Leikert merely serves as a primary combustion fuel. The patent to Leikert itself distinguishes between coal dust that is fed into the primary flame zone 7 as a primary fuel and coal dust that is injected into the secondary flame (reduction) zone 8.

The Examiner's attention is directed to the Leikert patent at column 2, lines 44 – 53, which discloses that the coal dust for reduction purposes may be differently prepared than the coal dust intended for primary fuel purposes. Leikert specifically distinguishes that the coal dust introduced into its primary fuel zone 7 is for primary fuel purposes (not reduction purposes) and that coal dust injected into its secondary flame zone 8 is for reduction purposes. Specifically, column 2, lines 57 – 59, states: "The carrier gas for the primary coal dust and/or the reduction coal dust is selected from the group: air, flue gas of the combustion or mixtures thereof."

In fact, increasing the amount of coal dust introduced into the primary flame zone 7 of Leikert would merely change the air to fuel ratio (stated, in column 3, line 61 of Leikert as $n = 0.9$). Therefore, with Leikert's arrangement, reduction would still be effected in the secondary flame zone 8.

In marked contrast to the Leikert method, the method of the present invention for reducing NO_x does not require that the NO_x reduction is accomplished in a secondary zone and is thus neither anticipated by, nor obvious in view of, the types of systems and methods like that of Leikert; again, in contrast to the present invention, Leikert teaches that the NO_x is produced in the primary flame zone before

the thus-produced NO_x is then reduced in the secondary flame zone.

Again, in contrast, in the present invention as recited in claim 7, the NO_x reducing agent is introduced directly into the primary zone - that is, the flame core at which the combustion fuel and the primary air are fed – so that the NO_x reducing agent is distributed in the flame core. In the event that the respective NO_x reducing agent that is introduced is a hydrocarbon, this hydrocarbon is not a nitrogen-containing fuel and this hydrocarbon remains practically unburned and therefore does not substantially contribute to the heat production.

Neither of the secondary references Beer or Svendssen et al discloses supplying a reducing agent to the flame core.

Likewise, U.S. Patent No. 4,739,713 to Vier et al, which is combined with Leikert to reject claim 7 of the present application under 35 U.S.C. 103(a), does not disclose supplying a reducing agent to the flame core. The mere fact that Vier teaches that coal dust is known to include nitrogen would not lead one of skill in the art to completely modify the Leikert arrangement, without ANY suggestion from the Leikert reference itself, and introduce a reducing agent into Leikert's primary flame 7 instead of its secondary flame zone 8.

For the reasons set forth above, the Applicants respectfully submit that claims 7 – 9, 11, 12, and 16 - 19 are patentable over the cited references and request withdrawal of the respective rejections of these claims under 35 U.S.C. 102 and 103.

In light of the foregoing argument in support of patentability, the Applicants respectfully submit that this application now stands in condition for allowance. Action to this end is courteously solicited. However, should the Examiner have any further comments or suggestions, the undersigned would very much welcome a telephone

call in order to discuss appropriate claim language that will place the application into condition for allowance.

Respectfully submitted,


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